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ABSTRACT

This study explores mathematics performance between boys and girls in terms of attitude toward mathematics and the average standardized scores in reading and mathematics between the 30th and 85th percentiles. Participants were 7th grade students from a private school in an urban area who registered in a course intended for students of average ability. The reading and mathematics subtests of the Iowa Test of Basic Skills (ITBS) were used to determine relationships between the scores and confidence to predict achievement in this course. The results show that the boys' standardized test scores were higher than the girls' scores, and that achievement in this group could not be predicted by standardized scores in reading and mathematics. Both of these results are in contrast to reports by many previous research findings. (Contains 10 references.) (KHR)

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Do Girls Rule ?

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While looking at the performance of seventh grade boys and girls in mathematics we found several references in which it was claimed that girls were being shortchanged in mathematics education. In the highly publicized report "How Schools Shortchange Girls: A Study of Major Findings on Girls and Education" it was stated that girls are not well served by our schools - that gender differences in performance result from institutional unfairness (Kleinfeld 1998). Hornblower said "Girls today are in trouble. They lose confidence in early adolescence. Their grades plummet, and, following sexual stereotypes, their interest in math and science flags. They are plagued by eating disorders, suffer depression, get pregnant, and attempt suicide. And it all makes headlines, spawns research projects, and prompts calls for single-sex education."(Hornblower 1998, p. 90).

During the late Summer and early Fall of 2001 a number of articles - mostly in the popular press - promulgated the opposite hypothesis. In People Weekly, "Behind the Silence" (1998) boys are said to be in crisis. Time in August 2000 reviews two books, "The War Against Boys," and "Real Boys' Voices" with the same theme. U. S. News and World Report of July 30, 2001 features on its cover an article entitled "Boys: The Weaker Sex?" This article reports that while "there is evidence that boys may feel more stress (than do girls) in emotional situations, they routinely show less" (Mulrine 2001, p. 41). And from abroad, in The Australian of 28 December 2001, we find an article entitled "For Boys, School is a Girl Thing." (Neill 2001) Neill in her article states that the average Australian boy would be insulted to be called a gifted student.

Each of these articles makes the point that boys fail to reach their potential because of stress due to their attempts to fulfill the role that society has decreed for them. Boys, because of the way they are raised, can't express pain and frustration in acceptable ways.

We sought the answers to two questions about our own group of 7th grade students registered in Mathematics 7, the mathematics course at our school intended for students of average ability - "average ability" being defined as students whose standardized test scores in reading and mathematics are between the 30th and 85th percentiles. The questions are:

(1) Can we find evidence that for either group, boys or girls, mathematics performance differs from what would be predicted by their selection scores in reading and mathematics?, and,

(2) Are there measurable differences in attitude toward mathematics between boys and girls?

Our study was conducted in the seventh grade of a private school in an urban area. The student body is predominately African-American. There were 40 students in two classes, 26 boys and 14 girls. We eliminated from our data those students for whom we did not have complete data due to their absence from school or because they entered school after the standardized tests were administered. This left a total of 33 students, 21 boys and 12 girls, in our study.

The middle school staff decided, at the beginning of the second semester, to group these students for mathematics instruction. That created a small class (15 students) of lower-achieving students, and a larger class (25 students) of those who had been achieving at a higher level. We used their groupings to look at four cells: there were 15 males of higher achievement, 6 males of lower achievement, 5 females of higher achievement, and 7 females of lower achievement. We eliminated from our study those students for whom data was incomplete.

We first attempted to determine whether the selection scores could be used with any confidence to predict achievement in this mathematics course. We used the reading and

mathematics subtests of the Iowa Test of Basic Skills (ITBS) which was administered to all students during the morning on three successive days in October 2001, and the students' average mathematics grades (expressed in percent) for the first three quarters of the current school year. Students in both classes were given the same assignments and took the same tests. The same teacher teaches both classes.

It is reasonable to assume that if there is predictive value in the standardized test scores, there should be a linear relationship between test scores and grades in mathematics. Linear regression analysis as shown in the table below yielded no predictive property for either gender or for subgroups of either sex. In the case of the higher achieving girls in particular, there is a (very low) negative correlation between the reading test and mathematics grade and a zero correlation between the math test and mathematics grade.

LINEAR REGRESSION

	Higher Achievement	**Lower Achievement**
	N = 15	N = 5
	Avg. Grade: 88	Avg. Grade: 82
	Linear Regression (Reading)	Linear Regression (Reading)
	Grade = 0.08(Rdg) + 83	Grade = 0.3(Rdg) + 66
Boys	Correlation Coefficient: 0.28	Correlation Coefficient: 0.67
	Linear Regression (Math)	Linear Regression (Math)
	Grade = 0.23(Mth) + 76	Grade = 0.44(Mth) + 63
	Correlation Coefficient: .59	Correlation Coefficient: 0.60
	N = 6	N = 7
	Avg. Grade: 89	Avg. Grade: 77
Girls		
	Linear Regression (Reading)	Linear Regression (Reading)
	Grade = -0.05(Rdg) + 91	Grade = 0.3(Rdg) + 66
	Correlation Coefficient: -0.14	Correlation Coefficient: 0.67
	Linear Regression (Math)	Linear Regression (Math)
	Grade = 0.07(Mth) + 88	Grade = 0.21(Mth) + 79
	Correlation Coefficient: 0.00	Correlation Coefficient: 0.23

The data show that achievement in this class can not be predicted by these standardized test scores in reading and mathematics, thus giving no answer to our first question. This is in contrast to reports by many researchers who have found a high correlation between standardized test scores and mathematics achievement for students at the higher extremes of the scale. (Benbow 1992)

These data give rise to a number of questions: Do these students exert maximum effort on the standardized tests or do they just make patterns? One girl in the lower achieving group whose ITBS math score was at the 9th percentile and whose reading score was at the 16th percentile earned an 85 in her math class. A boy with ITBS achievement scores at the 8th percentile in reading and 28th percentile in math was placed in the higher achieving class by his teacher and earned an 86 in class. With the current emphasis on accountability, schools and teachers need to find ways to encourage the students to take these tests more seriously.

Generally, the boys' standardized test scores are higher than the girls' scores, and a greater proportion of the boys were selected for the higher achieving group. These results contradict the statement of Kimball that "During the junior high and high school years, the most common finding is that girls achieve significantly better math grades than do boys." (Kimball 1989)

Data for lower achieving girls

Student No.	Total Rdg	Total Math	Math Grade
1	10	18	86
2	82	19	84
3	29	23	88
4	16	9	85
5	40	12	77
6	20	21	85
7	17	18	74

Data for higher achieving girls

Student No.	Total Rdg	Total Math	Math Grade
1	59	32	87
2	18	34	96
3	58	28	96
4	57	55	83
5	33	14	81
6	60	39	90

Data for lower achieving boys

Student No.	Total Rdg.	Total Math	Math Grade
1	41	21	86
2	8	12	58
3	70	48	82
4	39	43	80
5	16	31	79

Data for higher achieving boys

Student No.	Total Rdg.	Total Math	Math Grade
1	50	31	83
2	56	56	87
3	57	87	80
4	46	36	88
5	86	61	89
6	8	28	86
7	43	52	92
8	48	48	86
9	39	33	76
10	43	94	84
11	59	86	87
12	60	52	98
13	91	99	99
14	25	52	93
15	39	87	88

Was the increased teacher attention made possible by grouping responsible for improved performance? Studies have shown that there is a correlation between effort and classroom test scores, especially for girls. (Felson and Trudeau 1991). Are these girls simply trying harder?

To approach the second question, the Fennema-Sherman Mathematics Attitude Scale was administered to all the students. This was done at the beginning of the class period early during the fourth academic quarter. The students were instructed to respond to each item quickly, recording their immediate response to each item. The students were told that their answers would be treated anonymously. They responded on a 5 point Likert scale with responses ranging from "Strongly Agree" to "Strongly Disagree." The responses were tallied separately for each of the four groups of students. Some students left blank responses to some items, and a few commented on some questions "I don't understand."

The results should be very reassuring to the students' teachers and to their parents. They show a strong overall positive attitude toward mathematics. For example, all the students responded either "Strongly Agree" or "Agree" to the item "I would be proud to be the outstanding student in math.", and they all disagreed with "My mother wouldn't encourage me to plan a career which involves math."

All the questions designed to investigate parental interest and support elicited generally favorable responses, with a number of "Undecided."

On a number of survey questions, the overall response tended to be "Undecided." These items included:

- I am sure I could do more difficult work in mathematics.
- Males are not naturally better than females in mathematics.
- I would expect a woman mathematician to be a manly type of person.
- My teachers would think I wasn't serious if I told them I was interested in a career in science and mathematics.
- Figuring out math problems does not appeal to me.
- When a woman has to solve a math problem, it is O.K. to ask a man for help.
- Females are as good as males in geometry.
- I'll need a firm mastery of math in my future work.

These may indicate that some of the students are a little insecure about math and about gender roles as related to mathematics.

There were a few items on which the responses of one group - the lower achieving girls - showed more variability than did the responses of the other three groups. They were:

- I would talk to my teachers about a career which uses mathematics. (4 would not)
- Most subjects are OK but I seem to goof up in math class. (5 agree)
- Math makes me feel uncomfortable, restless, grouchy, impatient. (2 agree)
- I'm no good in math. (2 agree)
- I haven't usually worried about being able to solve math problems. (5 disagree)
- I would trust a woman as much as a man about being able to solve math problems. (5 agree)
- Figuring out math problems does not appeal to me. (5 agree)
- I'll need firm mastery of math for my future career. (all disagree)

This does show some lack of confidence in their ability to achieve in mathematics, and a slight tendency to think of mathematics as a male domain, as concluded by Fennema and

Sherman, who reported "as early as sixth grade, girls expressed less confidence than boys in their ability to do mathematics, and the subject was sex-typed male." (Fennema and Sherman 1978, p. 203)

Conclusion:

The data do tend to support the conclusions of a number of researchers that boys score higher on standardized tests than do girls, but that classroom achievement for the two sexes is approximately equal. For this group of students those standardized test scores are not predictive of classroom achievement. Boys and girls do equally well in class. Do the girls try harder?

These students have a positive attitude toward mathematics, with the girls showing a slightly more tentative approach . Many of the girls were in the "Undecided" category with respect to questions about mathematics as a male domain. The small size of the sample (12 girls) makes it difficult to support any statistically significant result.

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